Natural Heritage & Endangered Species Program

Commonwealth of Massachusetts
Division of Fisheries & Wildlife
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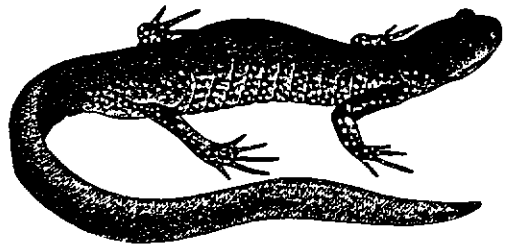
MASSACHUSETTS SPECIES OF SPECIAL CONCERN

Jefferson Salamander
(Ambystoma jeffersonianum)

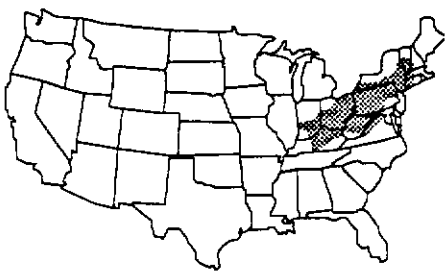
DESCRIPTION: Jefferson Salamanders are moderately large and slender with very long toes and a wide snout. They are grayish brown to dark brown in color with a lighter bluish gray underside. There are often pale bluish gray flecks on the limbs and sides of the body. The males range from 11.0 to 18.5 cm (4.4 to 7.4 in.) in total length, about 50% of which is comprised of a strongly-compressed tail. Adult females have a total length of 12.9 to 19.6 cm (5.1 to 7.8 in.), with slightly shorter, non-compressed tails. During breeding season, they appear less slender than the males due to their burden of eggs. The larvae have short stubby bodies and very large heads with an unpigmented throat and chin. The larvaes' backs are marked with pairs of blacks spots separated by a mid-dorsal black line, and the sides of their bodies are marked with a mid-lateral row of lighter spots.



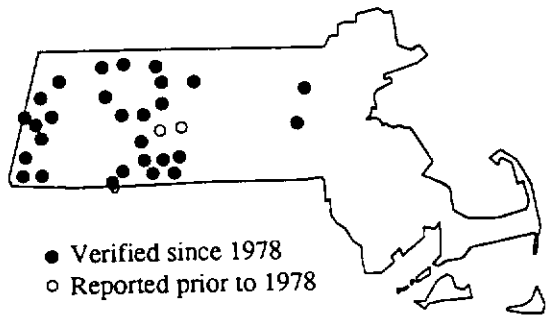
DeGraaf, Richard M., and Rudis, Deborah D., New England Wildlife. Habitat, Natural History, and Distribution. 1986

SIMILAR SPECIES IN MASSACHUSETTS: The Jefferson Salamander is a member of the Jefferson Salamander complex. Other recognized "mole" salamander members are the Blue-spotted Salamander (A. laterale), the Silvery Salamander (A. platineum), and Tremblay's Salamander (A. tremblayi). The Silvery and Tremblay's Salamanders originated from hybridization between the Jefferson and Blue-spotted Salamanders. The two hybrid forms are almost always female and triploid—that is, their cells contain three complete sets of chromosomes rather than the normal two sets (diploid).

When either the Silvery or Tremblay's Salamanders are present in an area, they may outnumber the Jefferson or Blue-spotted Salamanders by a 2:1 margin. A population with many more females than males is a good indicator of the presence of Silvery or Tremblay's Salamanders. The mode of reproduction of these female hybrids is gynogenesis: sperm is obtained from male diploids to stimulate egg division, but no genetic recombination occurs. However, additional hybrid forms such as triploid males and tetraploid and diploid females have been found, indicating that at least some offspring retain genetic material from two parents. The members of the complex form a continuum in appearance from the grayish-brown coloration, pale blue flecks and wide snout of the Jefferson Salamander to the bluish-black coloration, prominent blue spots, and narrow snout of the Blue-spotted Salamander. The two main hybrid forms are best identified by chromosome counts or size of red blood cells in conjunction with



Range of the Jefferson Salamander



Distribution in Massachusetts

their external appearance: the Silvery Salamander is almost identical to the Jefferson Salamander but is smaller, and the Tremblay's Salamander closely resembles the Blue-spotted Salamander but is somewhat larger.

RANGE: Jefferson Salamanders can be found from southwestern New Hampshire west to Indiana and south to Virginia and Kentucky. In Massachusetts, they and their silvery salamander hybrids occur within and to the west of the Connecticut River Valley. Jefferson complex salamanders found in eastern Massachusetts are more likely to be Tremblay's or Blue-spotted Salamanders.

HABITAT IN MASSACHUSETTS: Jefferson Salamanders prefer to reside most of the year in well drained upland deciduous or mixed forest, within 250 to 1600 meters of a small vernal pool or pond, commonly surrounded by alder, red maple, buttonbush, and dogwood. They hide beneath leaf litter, loose soil, and stones, or in rotting logs, rodent burrows, or subterranean burrows which they excavate.

LIFE CYCLE/ECOLOGY: Jefferson Salamanders hibernate underground in the winter months, usually near breeding sites. In March and April (sometimes as early as February), they congregate in large numbers at temporary ponds, where they court in pairs in the water at night. Breeding is thought to be triggered by the first early warm spring rains or other conditions of high humidity and above-freezing temperatures. One to two days after mating, the females deposit their eggs at night (or during the day if cloudy and rainy) on submerged branches, aquatic plants, or tree limbs dipping into the water. The eggs are deposited in small masses which average 16 in number, but can vary from 1 to 60; 100 to 286 eggs are laid in all.

After breeding has been accomplished, the adult salamanders leave the pond and migrate to their summer home. The eggs hatch in 30 to 45 days, and the larval stage ranges from 56 to 125 days. Larvae are cannibalistic. Juveniles reach sexual maturity at two to three years old. Adult Jefferson Salamanders feed on most animal life they can capture—small invertebrates, including worms, spiders, insects and their larvae, and aquatic crustaceans.

POPULATION STATUS IN MASSACHUSETTS: The Jefferson Salamander (including triploid and other polyploid forms within the A. jeffersonianum/A. laterale complex) is currently listed as a "Species of Special Concern" in Massachusetts. Forty-four current populations (1978 to the present) have been documented, as well as four historical populations (prior to 1978). The major threat to this species—and most salamanders in general—is the loss of wetland habitat to draining, development, and other causes. Some populations may also have been reduced or lost due to sample overcollection, foot and road traffic, and pesticides or other hazardous substances. Studies on the effects of acid rain on salamander eggs and larvae have been contradictory, and further studies must be made to resolve this issue. In the northeastern states, this species is considered rare and therefore is being inventoried by seven other Natural Heritage Programs.

MANAGEMENT RECOMMENDATIONS: In order to ensure the survival of this species in Massachusetts, the following recommendations regarding habitat preservation are suggested. There are two critical components in the life history of this species: the vernal pool habitat required for reproduction, and the upland forest habitat required for foraging, hibernation, and other terrestrial and fossorial activities. Conservation of the Jefferson Salamander—and all native members of the genus Ambystoma—must therefore focus on the preservation of vernal pools and small ponds known to be inhabited by this species, as well as a significant parcel (250–1600 meter radius) of upland habitat surrounding such breeding sites. Provided these habitats are not significantly degraded—and that the salamanders are not subject to illegal collection or high road mortality—the salamander populations should be capable of maintaining themselves indefinitely.

It should be kept in mind, however, that every population is unique. The majority of the population, for instance, may be concentrated in a relatively small and discrete upland habitat, which would safely allow carefully conducted development within some portions of the "uninhabited" habitat around the breeding pool without serious effects on the population. The only way to determine if such a case exists, however, is through a detailed environmental study conducted by a qualified researcher(s) over a series of years, charting the movements of the animals to and from the breeding site. Unless such a study is conducted, it should be assumed that the salamanders are relatively evenly distributed around the pool and development should be strongly discouraged within a minimum radius of 500–1,000 meters surrounding the breeding pool.

Vernal pools and breeding ponds must be protected not only from draining, filling, and development, but also from degradation in the form of road and lawn run-off. If lumbering is conducted within surrounding areas, a no-cut buffer zone of 50–100 feet should be established around the pool depression, and no slash or other debris should be dumped in the depression. While vernal pools receive some protection under the Massachusetts Wetlands Protection Act, and several vernal pool species (including the Jefferson Salamander) are protected under the Massachusetts Endangered Species Act, efforts should be made to register all vernal pools and to enhance and promote the enforcement of the laws mentioned above. Because of their ephemeral nature, vernal pools are often difficult to locate during dry periods and may be inadvertently damaged if their locations are not surveyed and marked prior to lumbering or construction operations.

Citizens must be encouraged to recognize and report Jefferson Salamanders and the locations of their breeding pools. Due to the rarity of this species, its ephemeral terrestrial occurrence, and its very specific habitat requirements, some populations undoubtedly remain undiscovered and therefore underprotected. Interested citizens with access to vernal pools should also be encouraged to monitor the annual production of their local salamander populations, as such data may prove invaluable in detecting population trends as well as catastrophic changes. Finally, citizens and landowners should be made aware that breeding pools degraded through pollution, drainage, or filling can often be restored to some extent, and that the possibility of reintroducing native species to such habitats should be investigated.

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NOTE: Vernal pools that are certified by the Natural Heritage and Endangered Species Program (NHESP) may be protected by the Massachusetts Wetlands Protection Act. If you would like more information about vernal pool certification, contact NHESP to obtain copies of the documents entitled "Guidelines for Certification of Vernal Pool Habitat," along with "Vernal Pool Field Observation Forms."

Vernal pools constitute a unique and increasingly vulnerable type of wetland that is inhabited by many species of wildlife, some of which are ENTIRELY dependent on vernal pool habitat for one or more stages of their life cycle. Two-thirds of the Commonwealth's rare amphibians (4 of the 6 species) are totally dependent upon vernal pools for breeding.

(continued overleaf)

SUGGESTED GUIDELINES FOR TIMBER HARVESTING NEAR VERNAL POOLS

Vernal pools provide critically important habitat for a number of rare and endangered species in Massachusetts. Certain precautions should be taken when harvesting in the vicinity of such pools to minimize impacts and preserve the character and physical environment that these species require. Although these pools may only actually be filled with water for a brief period of time in the spring, the most important measure that can be taken to protect the habitat is to recognize pool locations even in the "dry" season and take precautions to preserve the local environment around the pools. Recognizing these seasonal pools and considering the following guidelines will help protect these critical habitats:

1. Heavy equipment should not be permitted in vernal pool depressions at any time of the year. Avoid locating landings, skid roads, or haul roads through or near these depressions. It is important that the depressions not fill in with sediment from nearby areas of disturbed soil.

2. Similarly, do not stack logs or otherwise create soil compaction in vernal pool depressions.

3. Avoid operating logging machinery within approximately 50 feet of a vernal pool during mud season. Ruts deeper than 6 inches can disrupt migration routes of endangered salamanders. There should be no ruts deeper than 6 inches within 200 feet of a vernal pool. Similarly, the actual vernal pool depression should not be physically altered so that its ability to seasonally hold water is impaired.

4. Tree tops or slash should not be allowed to fall or be placed into vernal pool depressions. While many amphibians use downed woody material to attach their eggs to, no additional material should be added to a pool. If tops or branches do fall into a depression, they should be removed. Similarly, existing natural woody material should NOT be removed from vernal pool depressions.

5. It is important that the temperature and relative humidity at the soil surface be maintained in the cool, moist condition necessary for amphibians that use vernal pools. Thus, it is important that these vernal pools, and an area within 50 feet of these pools, be maintained in a shaded and mostly undisturbed condition.

    a. Do not clearcut these areas. Some forest cover must be maintained to provide continuous shade and protection from high temperatures at the soil surface. Do not leave only trees with small or damaged tops, or those that appear to be dead or dying. Established understory vegetation such as mountain laurel, hemlock, or naturally established advanced regeneration can provide shade. Similarly, shade can be provided by vigorous hardwood sprouting following a harvest.

    b. Avoid disturbance of the mineral soil within 50 feet of a vernal pool depression for several reasons. First, it is important that sediment not accumulate in vernal pool depressions. Second, the exposure of mineral soil removes the natural insulation provided by the accumulated litter on the forest floor. This litter can be several inches thick and can keep actual soil moisture and temperature from getting too high, even if exposed to direct sunlight. For these reasons, it would be best to operate in the vicinity of vernal pool depressions when the ground is frozen and covered with snow. Under other dry conditions, it would be advisable to not operate machinery within 50 feet of a pool depression, and to winch timber (if any is cut within this radius) out of this area. Finally, it would be advisable not to operate within 50 feet of a vernal pool depression during mud season, so as to not create ruts.